



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.04.2004 Bulletin 2004/17

(51) Int Cl.7: **B28B 7/46, B28B 3/02**

(21) Application number: **03076343.7**

(22) Date of filing: **15.05.1998**

(84) Designated Contracting States:
DE ES FR IT

(30) Priority: **24.07.1997 IT FI970178**

(62) Document number(s) of the earlier application(s) in
accordance with Art. 76 EPC:
98830295.6 / 0 893 219

(71) Applicant: **Longinotti Meccanica S.r.l.**
50019 Sesto Fiorentino (Firenze) (IT)

(72) Inventor: **Longinotti, Alfredo**
50133 Firenze (IT)

(74) Representative: **Mannucci, Michele et al**
Ufficio Tecnico Ing.A. Mannucci S.R.L.,
Via della Scala 4
50123 Firenze (IT)

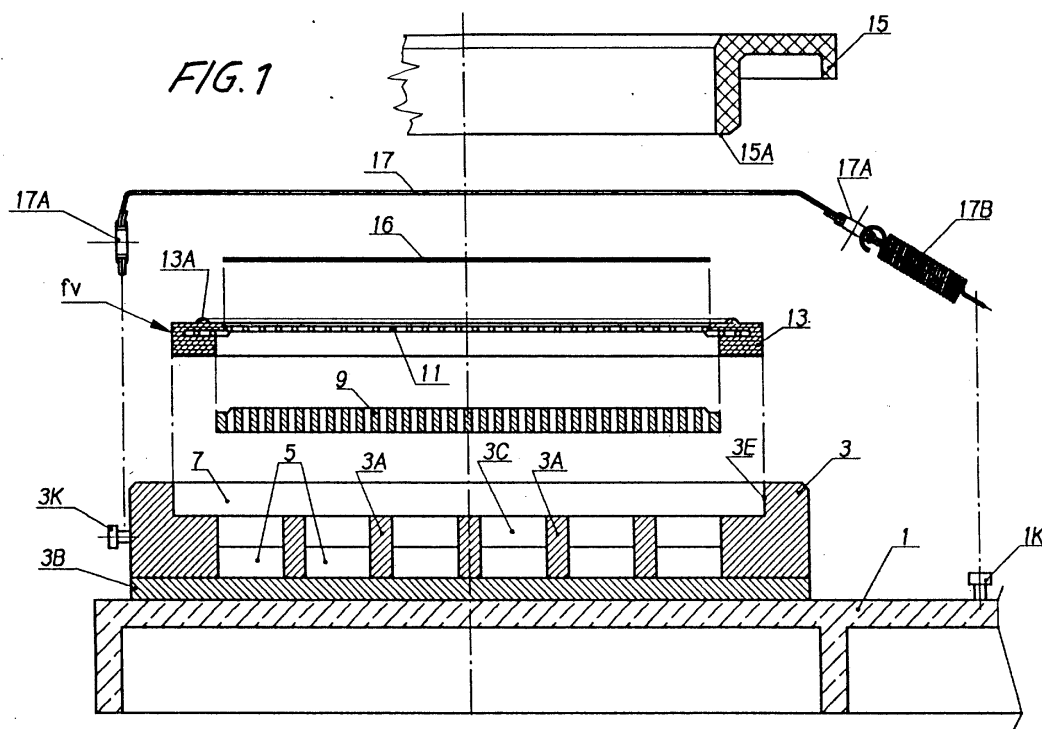
Remarks:

- This application was filed on 07 - 05 - 2003 as a
divisional application to the application mentioned
under INID code 62.
- Claim 11 is deemed to be abandoned due to
non-payment of the claims fee (Rule 31 (2) EPC).

(54) **Apparatus for producing thin tiles of cement paste**

(57) In the press, which includes one or more stations, each mold comprises a bed (3) stiffened by grids (3A, 3B), a plate (9) and a filtration layer (19) for the liquid of the paste, and also channeling for disposal of the liquid; on the bed is a peripheral seal (15) for sup-

porting the frame (17) of the mold; the plate (9) contains a plurality of narrow channels (21) for drainage of the filtered liquid, said channels being connected to the liquid disposal channeling, with the filtration layer (19) laid over the top of these.



Description

[0001] The invention relates to an apparatus that has been devised to manufacture thin tiles from cement paste by pressing it in the molds of turntable presses comprising one or more stations set up. In such apparatus each mold comprises a bed that is stiffened by grids, and that filters and drains the liquid from the paste during pressing; the liquid is carried away through channeling for the disposal of the liquid; and on the bed is a peripheral seal for supporting the frame of the mold.

[0002] The invention has the purpose of improving the structure of the molds, particularly as concerns filtration, in order to produce satisfactory products. This and other objects and advantages will become clear in the following text.

[0003] To this end the apparatus according to the invention comprises a plate with a plurality of narrow channels for draining off the filtered liquid, said channels being connected to the liquid disposal channeling.

[0004] In one possible embodiment, said narrow channels are divided into two series of channels, the channels of each series being parallel with each other and the channels of one series intersecting the channels of the other series.

[0005] Said narrow channels will be sufficiently deep and/or their base will be sloping and run out at the edge to permit easy disposal of the liquid, and also to simplify cleaning.

[0006] The plate can be machined with liquid disposal channeling on the underside, with a plurality of discharge holes interfering with said channeling and beginning in a seat on the upper side for a perforated lamina with holes interfering with said narrow channels and corresponding to said discharge holes; a seat being formed in said perforated lamina for a replaceable seal - of rubber or the like - designed to fit the frame of the mold. To each of said discharge holes in the plate there may correspond four holes in the lamina.

[0007] A seat may be formed in the top of the plate to accommodate either the perforated lamina or, alternatively, a lamina with rubber, to prepare the mold for the production of conventional two-layer tiles.

[0008] The apparatus comprises a pressure block able to enter the frame of the mold with a small amount of play. In a further development of the invention, suction holes are formed around the perimeter of said block in the vicinity of the lower pressure face and connected to channeling leading to suction means, for the disposal of liquid collected between the frame and the block during pressing. Advantageously, said suction means comprise at least one annular manifold into which said suction holes feed, and at least one pipe for creating from outside of the block a vacuum in said manifold.

[0009] A plurality of pipes can be distributed around said annular manifold to ensure an even vacuum throughout the annular manifold. Said suction holes may be beveled at the outer end for complete suction of

the liquid phase that collects between the frame and the block.

[0010] The invention will be understood more fully on examining the description with reference to the accompanying drawing, which shows non-restrictive examples of embodiments thereof. In particular, in the drawing:

Fig. 1 shows a local section through a mold in an alternative embodiment;

Fig. 2 shows a partly sectional view on II-II as marked in Fig. 1;

Fig. 3 shows a local section on III-III as marked in Figs. 2 and 4;

Fig. 4 shows, in a similar way to Fig. 2, an alternative embodiment;

Fig. 5 is a section showing a mold with certain associated components;

Figs. 6, 7 and 8 show successive stages in the operation of a modified bed, Fig. 8 being a section through VIII-VIII as marked in Fig. 7;

Fig. 9 is a view on IX-IX as marked in Fig. 8;

Figs. 10 and 11 show a bed complete with its frame, and a local section through XI-XI as marked in Fig. 10;

Figs. 12 and 13 show a further alternative embodiment in section on XII-XII as marked in Fig. 13 with other components in an exploded view, and a plan view of the bed;

Fig. 14 shows how a bed can be equipped and used for the manufacture of traditional two-layer tiles; and Figs. 15, 15A and 16 show yet another alternative embodiment of a mold in vertical cross section, in an enlarged detail of Fig. 15 and as viewed from the plane marked XVI-XVI in Fig. 15.

[0011] As illustrated in the drawing, the bed of a mold - for presses constituting the apparatus as defined above - comprises a sturdy structure 1 supporting the bed of the mold for which the general reference is 3. This bed 3 contains a grid of lengthwise ribs 3A stood edge-on on a flat base 3B that in turn stands on the structure 1; these ribs 3A define a series of lengthwise channels 5 in the bed 3. Running between the lengthwise components or ribs 3A and above and through the channels 5 are bridge components 3C consisting of bars supported between the adjacent lengthwise components 3A to form a sturdy grid that forms part of the bed 3. This grid 3A, 3C together with the inner perimeter of the bed 3 forms a seat 3E for a perforated lamina 9; the bed 3 may take the form of a stainless steel plate with holes 11 made by machine in rows in two mutually perpendicular directions in positions such that the grid structure 3A, 3C corresponds to linear zones running between adjacent rows of holes 11. Around its edge, the lamina 9 forms a stepped seat 13 for an easily replaceable rubber seal 15; on this seal 15 rests the bottom edge 17A of the frame 17 of the mold, when this is positioned on the bed 3. 18 is the block. Laid over the plate

9 is the filter 19 which may be paired with a second filter 19 or may be layered, and which is interposed between the plate 9 and the frame 17. The pressing block 301 passes down into the frame 17 to compress the fluid mass and expel a large percent of the liquid phase through the filter 19. To ensure steady drainage, the upper surface of the plate 9 (on which the filter 19 rests) is formed into narrow channels 21 lying in one direction (Fig. 2) or two or more directions, as marked 21 and 23 in Fig. 4; the channels are laid out so as to interfere with the holes 11, where the water (with particles of cement) that has passed through the filter 19 is discharged.

[0012] The bed 3 contains passages 3P (see in particular Fig. 5) communicating with the channels 5, defined by the lengthwise components 3A, underneath the bridge components 3C. In this way the liquid collected by the channels 5 can be discharged via the passages 3P through discharge mouths 74 into a collecting manifold 75 for disposal.

[0013] Figs. 6-11 show a particularly efficient embodiment of a plate designed to replace the bed 3 of the version shown in Figs. 1-5. In this version the bed 3 is formed by a plate 103 machined to form edge-on ribs 103A defining channels 105, which are excavated mechanically as far as the perimeter of the two opposite sides of the plate 103; a base 103B - equivalent to the base 3B - rests on the structure 1; formed at one of the ends of the channels 105 are the passages 103P to allow the water to flow out toward the discharge 74 leading to the manifold 75. A removable closure 103K can be provided at the opposite end from the passage 103P to allow easy cleaning of the channels 105. the top of the plate 103 is machined to form the seat 103E for accommodating the perforated lamina such as 9 with holes 11 and with channels 21 and optionally 23. Once the channels 105 have been machined, and hence after the ribs 103A have been defined, through holes 103F are drilled between the seat 103E and the channels 105 at intervals from each other and lined up to correspond to the channels 105 with which they interfere, as can be seen clearly in Figs. 12-16. When the perforated lamina 9 with its seal 15 is positioned in the seat 103E in the plate 103, the holes 11 of said lamina 9 will each correspond - at least partially - with the holes 103F, in such a way as to ensure that the filtered water is discharged directly through the holes 103F into the channels 105. In practice each hole 103F will connect with four holes 11 in the lamina 9 (see Fig. 11). The liquid filtered through the filter 19 drains along the channels 21 and, if provided, 23, and there is therefore a very steady direct outflow of the liquid passing through the filter 19 toward the discharge point, with no significant variations in the path obstructed to a greater or lesser degree along the filtering surface.

[0014] The filter interposed between the plate 3 or 103 and the frame 17 may be composed of an ordinary fine-mesh fabric filter 19A and a large-mesh fabric underfilter 19B in order to bear the stresses of the pressure at the

interspaces defined by the narrow channels 21 and, where provided, 23, and by the holes 11.

[0015] An alternative embodiment of the plate 103 is shown in Figs. 12 and 13. A large plate 203 is machined to form a peripheral seat or channel 203E for an easily replaceable seal 215 equivalent to the seal 15. The plate 203 replaces the plate 3 or 103 and also the perforated lamina 9 because said plate 203 contains at least one and preferably two series of deep but narrow mutually perpendicular channels 205A and 205B extending to the edges of the plate, in such a way as also to form water discharge channels. In this case the collecting means will be formed by an annular manifold which collects the water from all four sides of the plate from the open ends of the channels 105A and 105B. However, it is also possible to stop up the ends of the channels on some of the sides in order to limit the area into which the water drains, since the channels 205A and 205B communicate with each other. The channels 205A and 205B can all be of the same depth but it is also possible for the channels of one series to be of a different depth to the channels of the other series. In fact the bottoms of the channels of at least one series may be sloping to promote the discharge of the water toward one side of the plate 203 or to two preferred sides.

[0016] A filtration bed as described above can also be modified quickly by replacing certain of its parts, in order to produce a structure for the pressing of traditional two-layer tiles, simply by replacing the plate 9 with the holes 11 in the seat 3E, as can be seen in Fig. 14. The plate 9 with the holes 11 is replaced with a strong lamina 309A to which is applied a liner 309B of vulcanized rubber on the lamina 309A and advantageously also forming a sealing edge 309C around the inside of the wall of the seat such as 3E or 103E. The vulcanized rubber 309B supports the bottom edge of the frame 17. This gives a mold for two-layer tiles, i.e. tiles with a bottom layer of fluid mortar, optionally with marble fragments, and a semidry top layer to absorb the excess water from the first or bottom layer, done in an entirely conventional way for the formation of two-layer concrete tiles. It is thus possible to convert a press for thin single-layer concrete tiles into an apparatus for forming two-layer tiles, and vice versa, by the simple replacement of inexpensive, easily replaceable parts that are easy to handle.

[0017] As can also be seen in Fig. 1, but more particularly in Figs. 15 and 16, the frame 17, which rests on and is pressed onto the seal 15 of the bed 3, is designed to receive the block 301 with a small amount of play. More specifically the block 301 can be made with an underplate 303 attached to the underside of the block 301 to form the surface that contacts and compresses the fluid mortar B designed to form the thin tile; the underplate 303 is very slightly smaller than the internal dimensions of the frame or ring 17 while the block 301 itself can be slightly smaller. On the underside of the underplate 303 is a liner 305 of rubber or other material, which may have indentations or reliefs to give particular mark-

ings on the surface of the tile formed from the fluid mortar B. Because the frame 17 is pressed onto the seal 15 and thus creates a highly watertight join, some of the liquid phase that separates from the material of the pressed tile produced from the fluid mortar B, and which does not pass through the filtering liner 19, tends to rise back upward between the frame 17 and the underplate 303, even occupying the space S between the block 301 and that part of the frame 17 that is above the underplate 303. When the block 301 is lifted after pressing, this water, accumulated between the block and the frame, tends to return onto the material of the tile, altering its composition and in particular weakening the outer edges of the pressed and not yet dried tile. A system is therefore provided to eliminate this accumulated water or other liquid phase from the region S in order to ensure that water does not run back down onto the freshly pressed tile.

[0018] To this end a suction network is provided between the gap S and a vacuum source so that the liquid is sucked out during the pressing or rather during the last phase of pressing, when the compression is at its greatest, so that the water or other liquid phase cannot drain back around the edges of the newly pressed tile as the block is lifted away. Holes 307 are formed in the underplate 303 in a perpendicular arrangement to the perimeter of this underplate and with outward beveling 307A that almost reaches the active lower surface of the underplate 303, 305. The holes 307 are distributed in any suitable uniform way around the perimeter of the underplate 303 and connect at the inward end with an annular manifold which may take the form of a channel 309 also cut into the underplate 303 and which is closed by the attachment of the underplate to the underside of the block 301, thereby forming an annular manifold. Two annular seals may be fitted between the underplate 303 and the block 301, inside and outside of the manifold 309 to ensure leaktightness between the underplate 303 and the block 301, as marked at 310 and 311. One or more holes 313 are formed in the block 301 and may be distributed in some suitable way around the manifold 309: they are combined by connectors 315 to hoses 317 connected to a vacuum source. The arrangement of the holes 313 is such as to produce an approximately uniform vacuum both in the manifold 309 and in the holes 307, which are distributed around the perimeter of the liner of the underplate 303. As a means of achieving this uniformity and the regularity of the presence of the suction holes 307, branches 309A of the manifold 309 can be provided at the corners of the underplate 303 so as to ensure suction is also provided at holes 307X located in the corner regions of the underplate 303. The holes 313 can also be made to connect with these branches 309A and can therefore be positioned in the corner regions of the underplate 303. By establishing the connection between the vacuum source connected to the hoses 317 and the entire suction network represented by the holes 313, manifold 309 and holes 307, the ability to re-

move the liquid from the gap S by suction both during pressing and more particularly at the conclusion of pressing and before the block is lifted away, is established. The liquid can at any rate be disposed of and prevented, after collecting in the gap S, from draining back down onto the pressed tile around its perimeter.

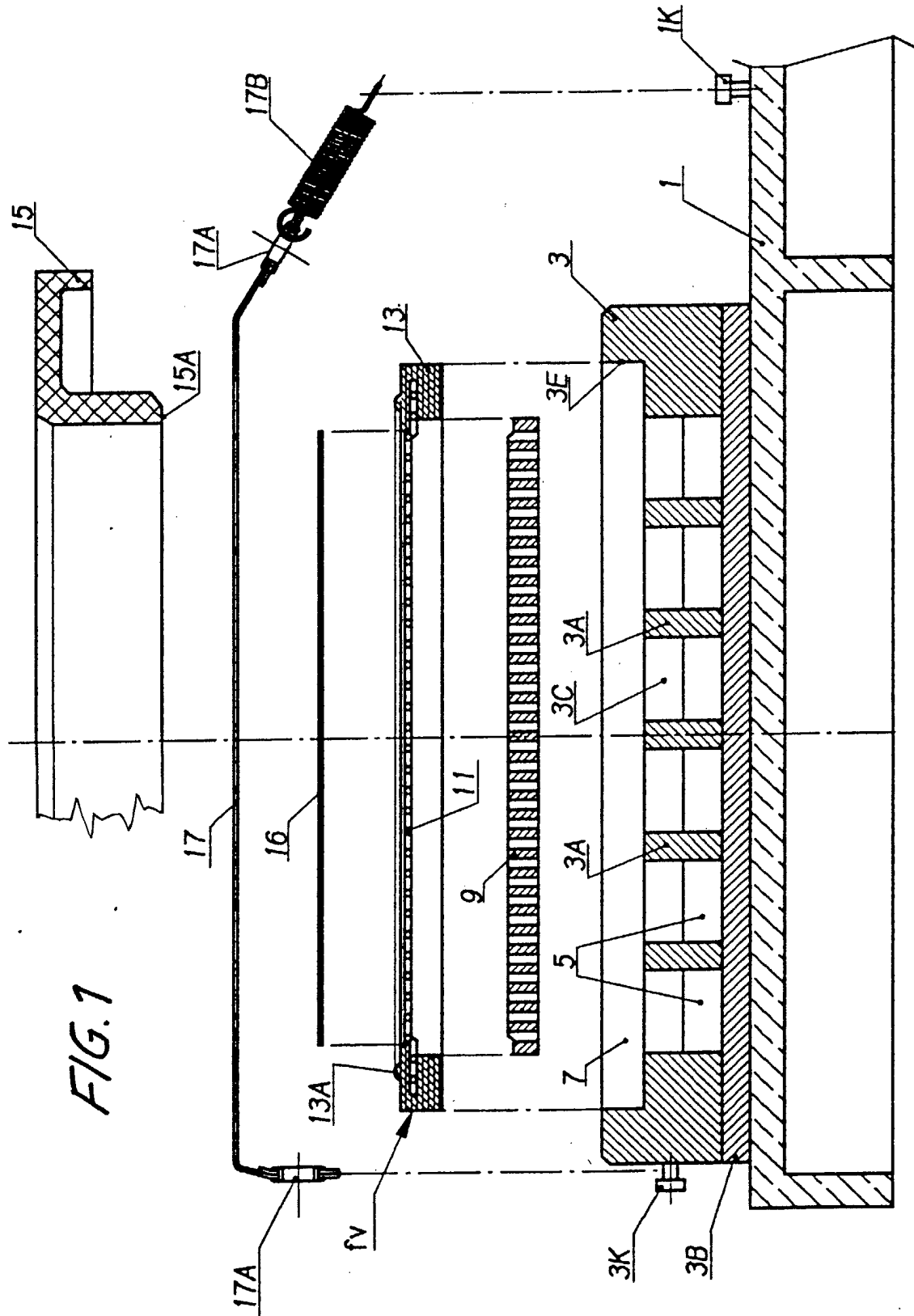
[0019] It should be understood that the drawing shows only an example purely as a practical demonstration of the invention, it being possible to alter said invention as regards shapes and arrangements without thereby departing from the scope of the concept on which the invention is based. The presence of any reference numerals in the appended claims is for the purpose of facilitating the reading of the claims with reference to the description and drawing, and does not limit the scope of protection represented by the claims.

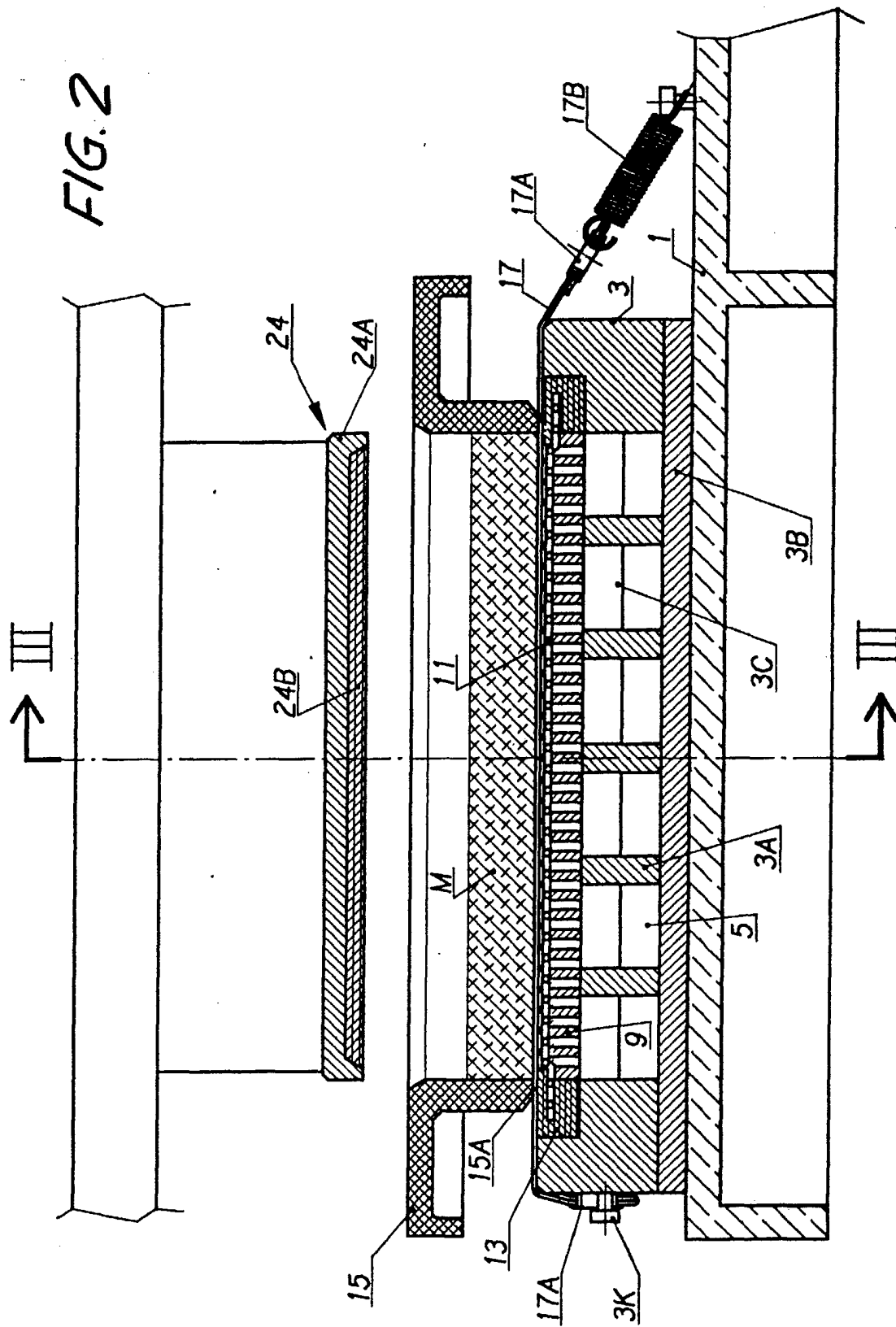
Claims

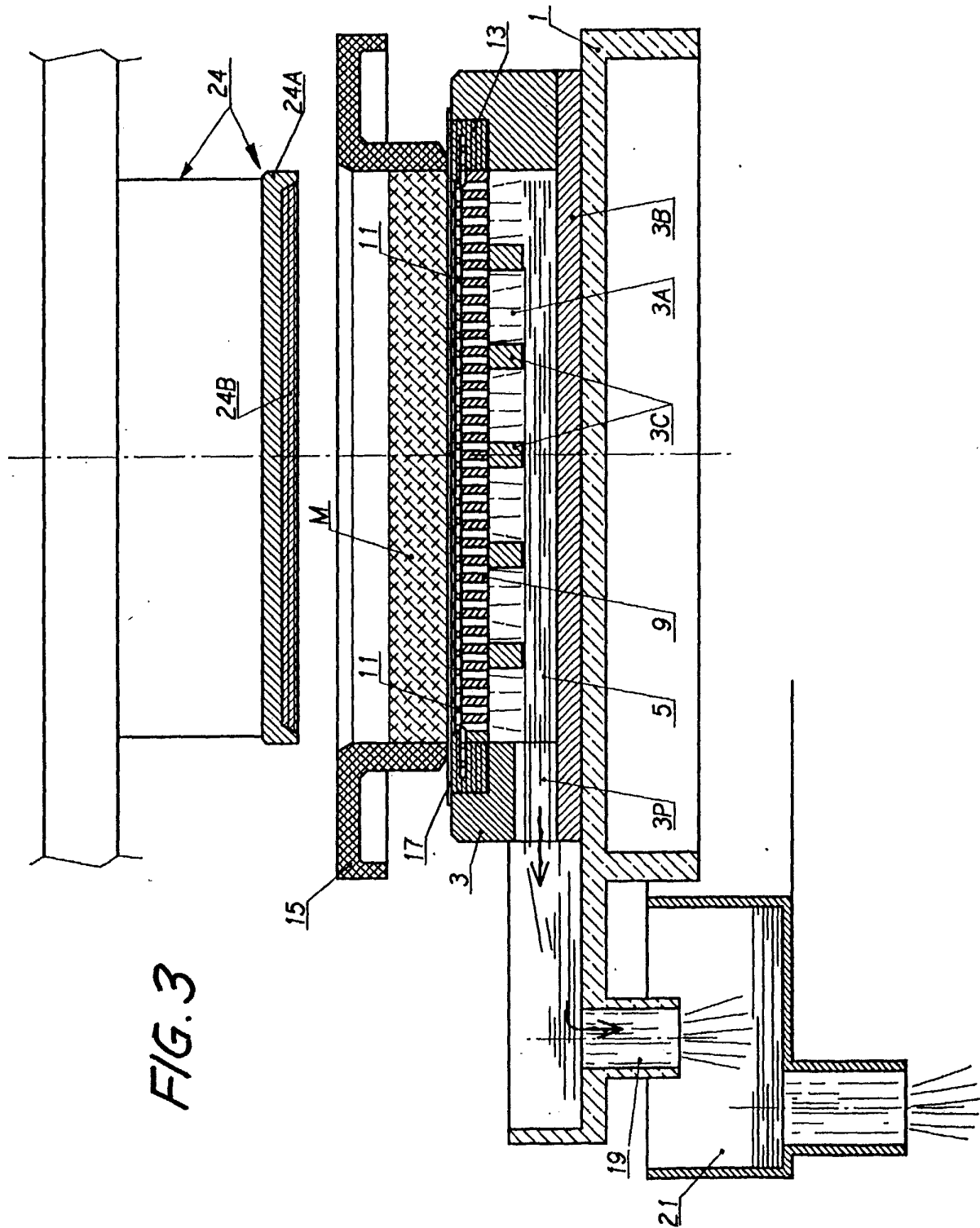
1. An apparatus for making thin tiles from cement paste by pressing it in the molds of presses comprising one or more stations, **characterized in that** each mold comprises a bed stiffened by grids, which filters and drains the liquid from the paste, with channeling for disposal of the liquid, on which bed is a peripheral seal for supporting the frame of the mold, **characterized in that** it comprises a plate with a plurality of narrow channels for draining off the filtered liquid, said channels (21 and/or 23) being connected to the liquid disposal channeling.
2. The apparatus as claimed in claim 1, **characterized in that** said narrow channels are divided into two series of channels (21 and 23), the channels of each series being parallel with each other and the channels of one series intersecting the channels of the other series.
3. The apparatus as claimed in claim 1 or 2, **characterized in that** said narrow channels (205A, 205B) are sufficiently deep and/or their base is sloping and runs out at the edge to permit disposal of the liquid.
4. The apparatus as claimed in claim 1 or 2, **characterized in that** it comprises a machined plate (103) with liquid disposal channeling (105) on the underside, with a plurality of discharge holes (103F) interfering with said channeling (105) and beginning in a seat (103E) on the upper side for a perforated lamina (9) with holes (11) interfering with said narrow channels (21 and/or 23) and corresponding to said discharge holes (103); a seat (13) being formed in said perforated lamina (9) for a replaceable seal (15) designed to fit the frame (17) of the mold.
5. The apparatus as claimed in claim 4, **characterized**

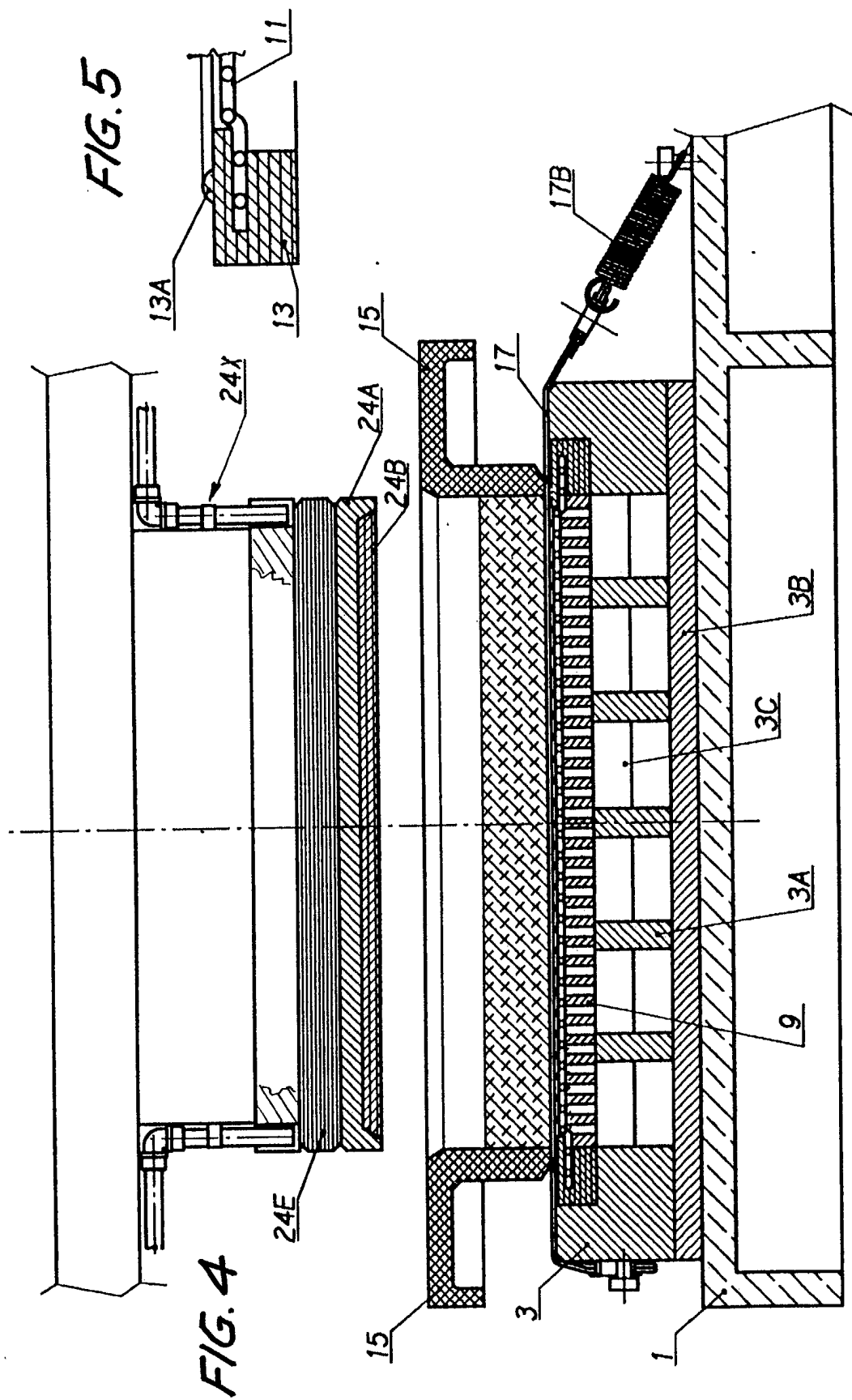
in that to each of said discharge holes (103F) in the plate (103) there correspond four holes (11) in the lamina (9).

6. The apparatus as claimed in claim 4, **characterized in that** a seat (3E; 103E) is formed in the top of the plate (3; 103) to accommodate either the perforated lamina (9, 11) or alternatively a lamina (309A) with rubber (309B), to prepare the mold for the production of two-layer tiles. 5 10
7. The apparatus as claimed in at least one of the preceding claims 7 ff, with a pressure block (301) able to enter the frame (17) of the mold with a small amount of play, **characterized in that** suction holes (307) are formed around the perimeter of said block (301) in the vicinity of the lower pressure face and connected to channeling (309, 313, 317) leading to suction means, for the disposal of liquid collected between the frame (17) and the block (301) during pressing, or at least in the last phase of pressing. 15 20
8. The apparatus as claimed in claim 7, **characterized in that** said suction means comprise at least one annular manifold (309) into which said suction holes (307) feed, and at least one pipe (315, 317) for creating from outside of the block a vacuum in said manifold (309). 25
9. The apparatus as claimed in claim 8, **characterized in that** it comprises a plurality of pipes (313; 317) distributed around said annular manifold (309) to ensure an even vacuum throughout the annular manifold. 30 35
10. The apparatus as claimed in at least one of claims 7-9, **characterized in that** said holes (307) are beveled at the outer end (307A). 40
11. Apparatus for making by pressing thin tiles from cement paste; all as disclosed hereabove and represented for example in the enclosed drawing 45 50 55









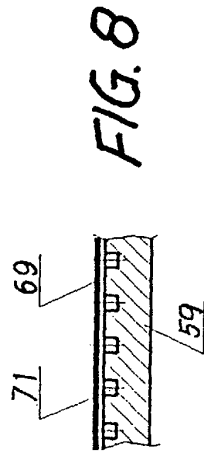
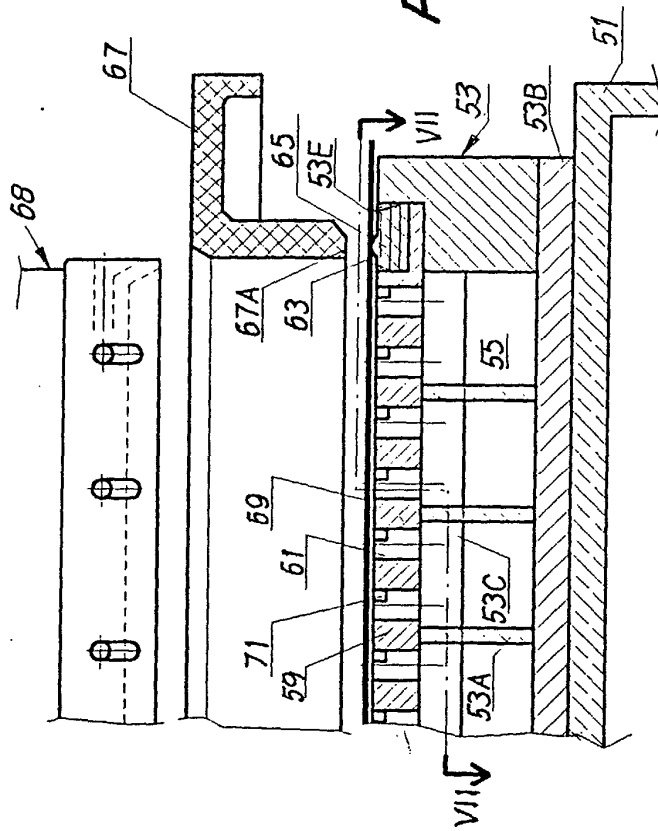


FIG. 9

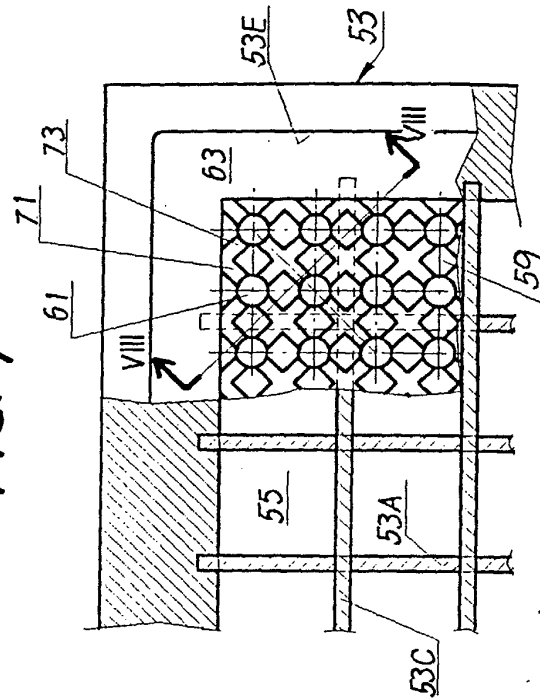
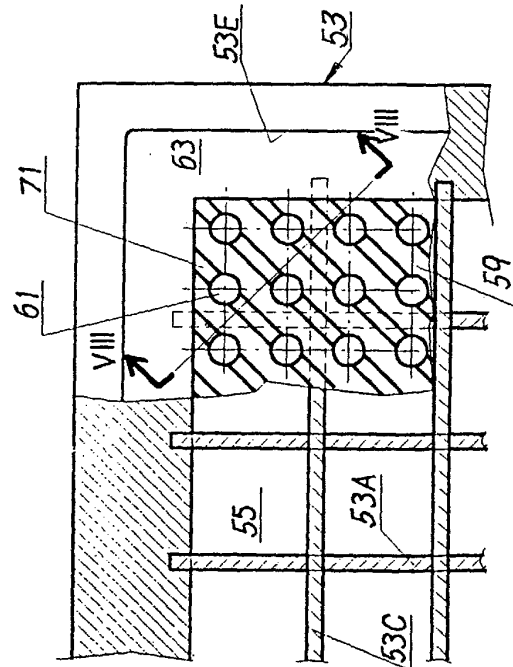
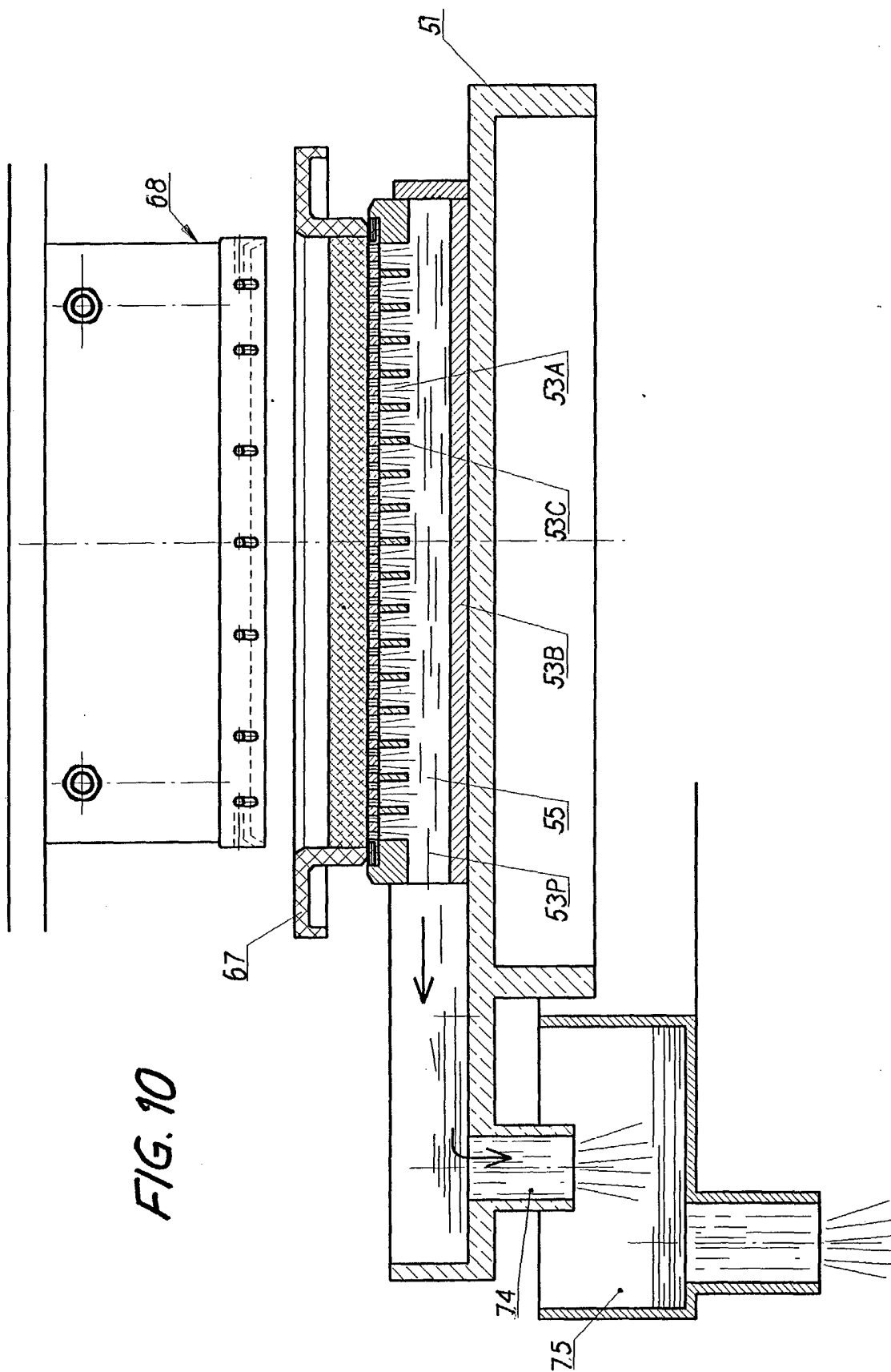


FIG. 7





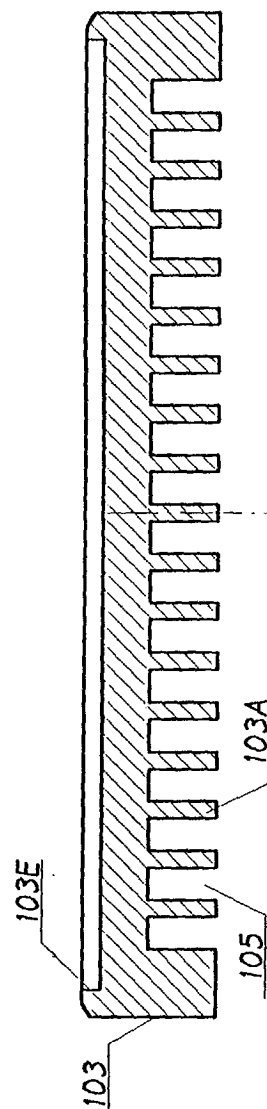


FIG. 11

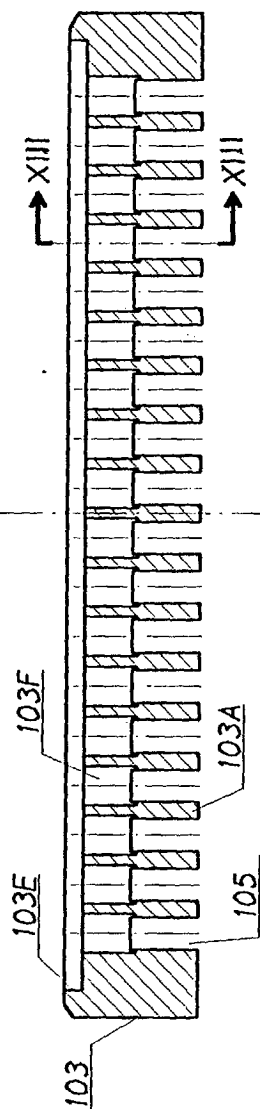


FIG. 12

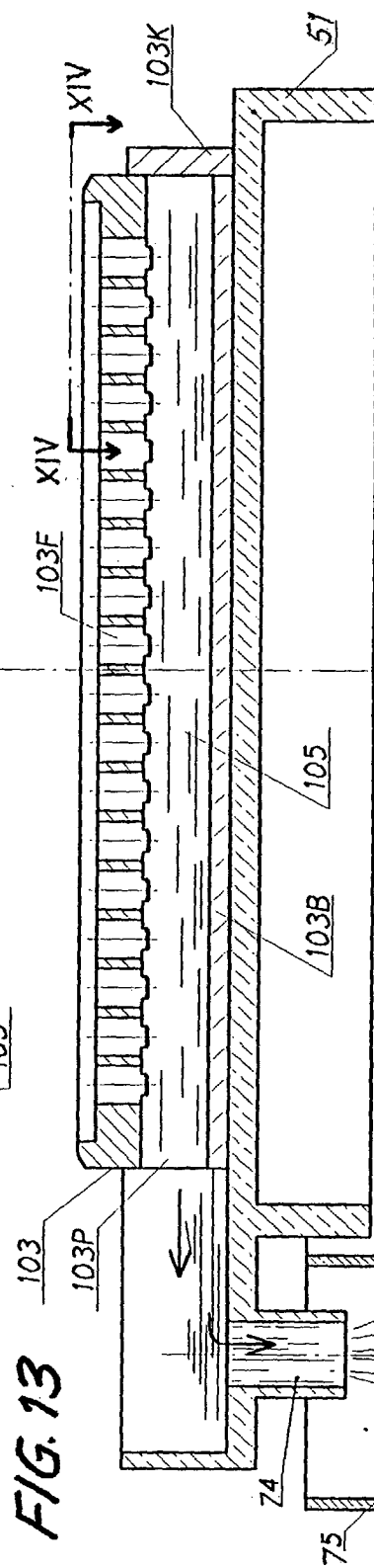


FIG. 13

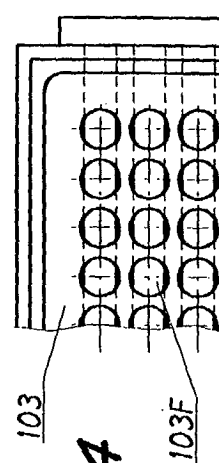


FIG. 14

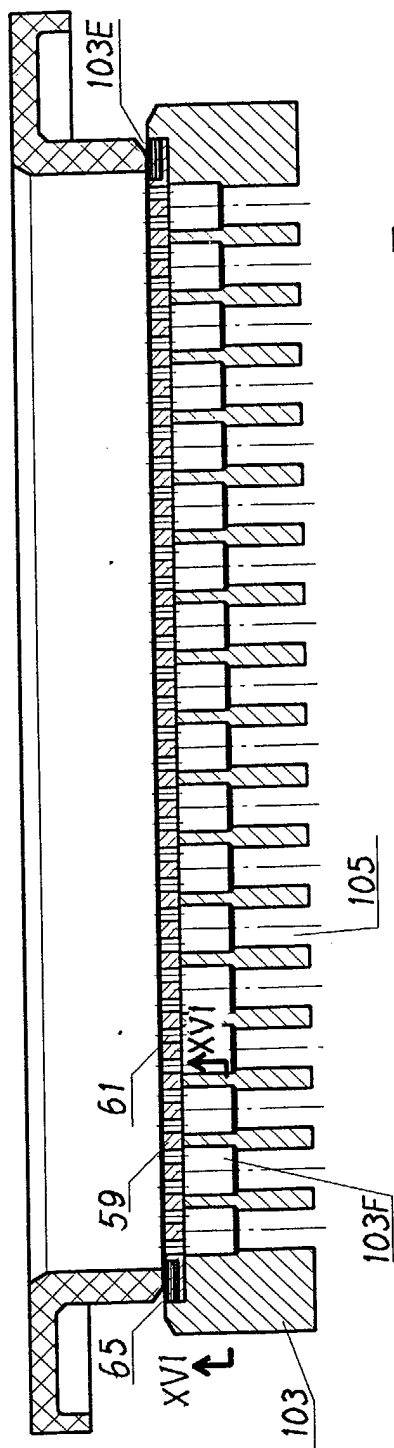


FIG. 15

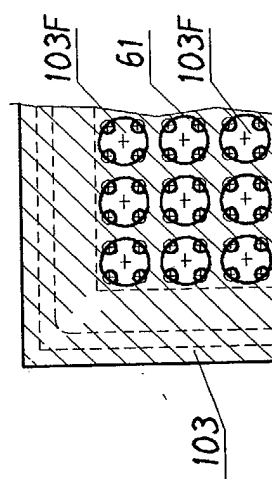


FIG. 16

FIG. 17

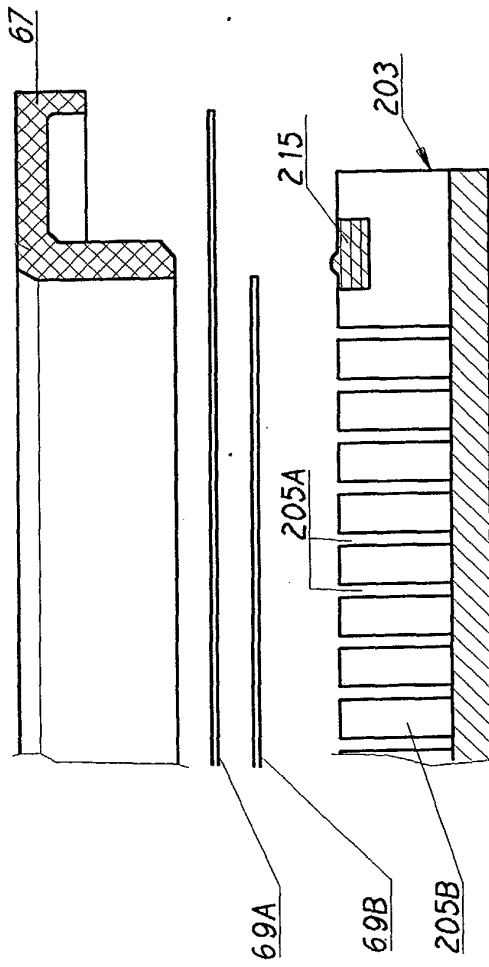
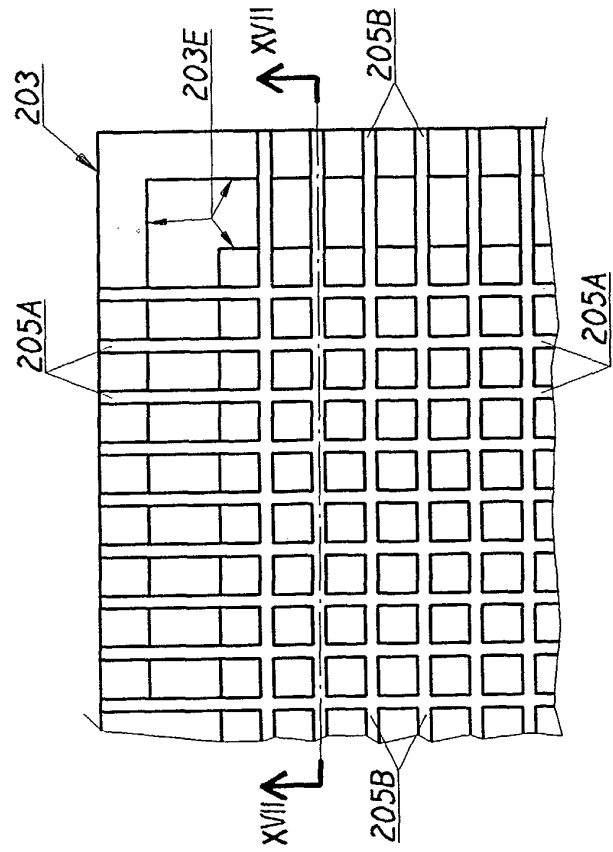
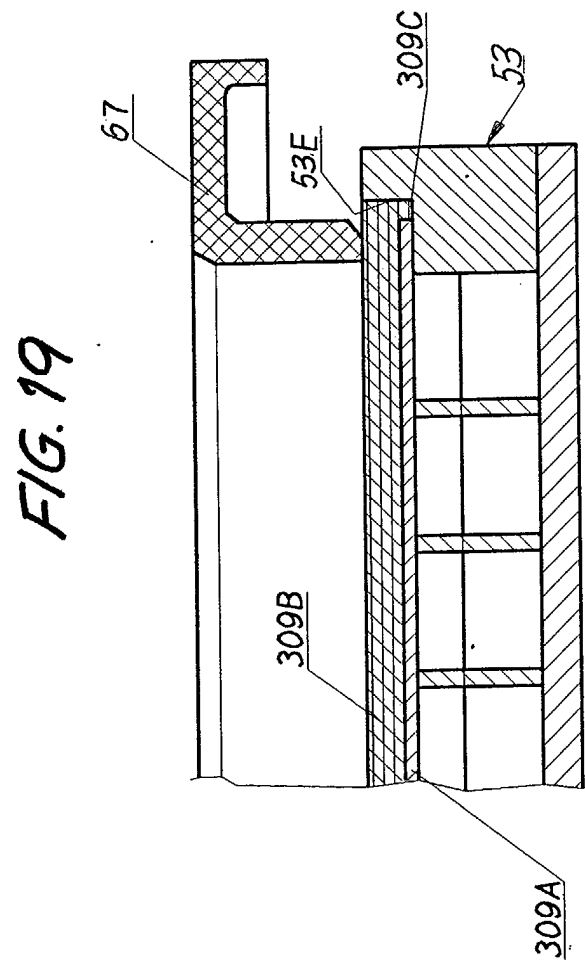


FIG. 18





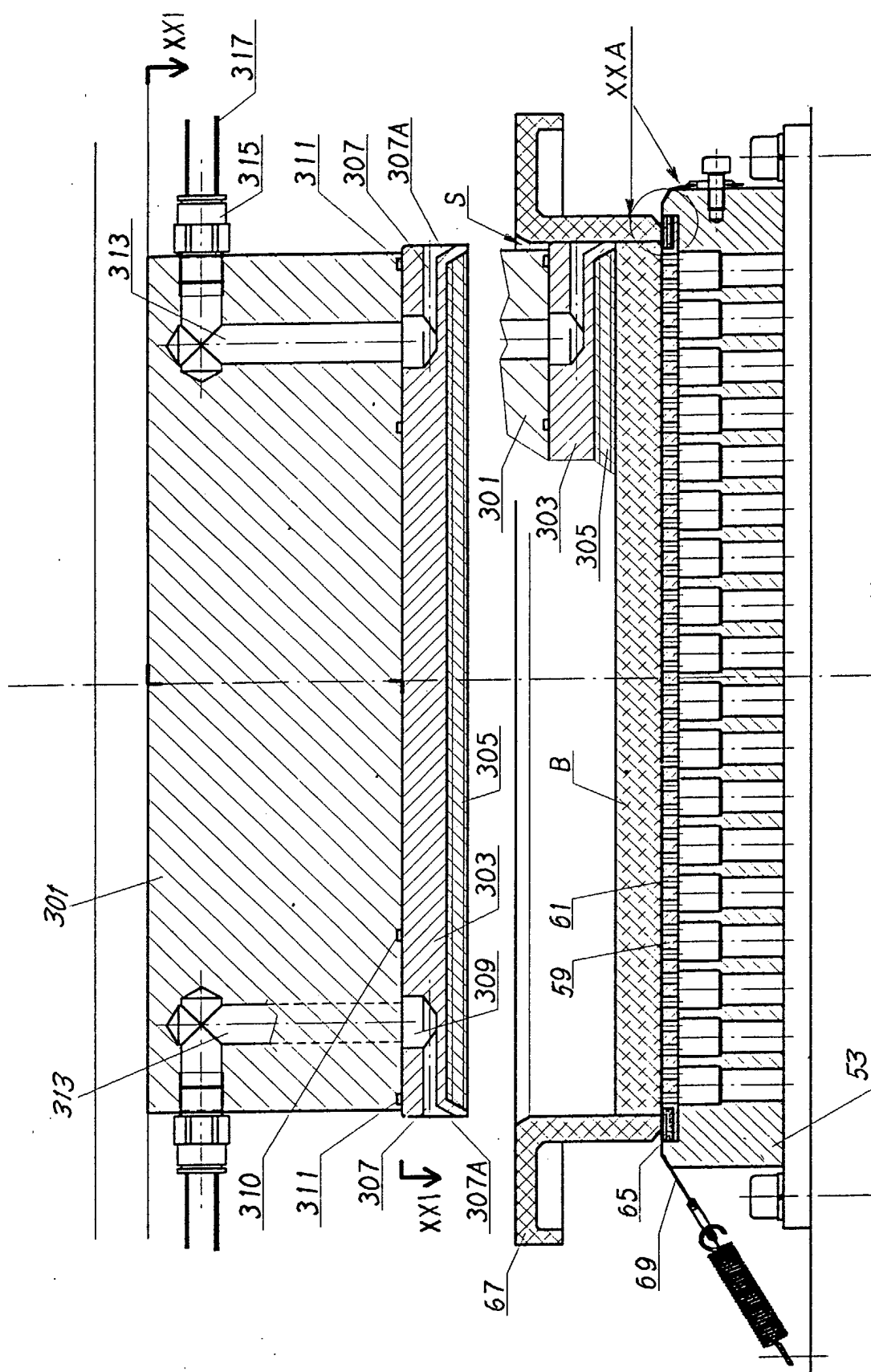


FIG. 21

FIG. 20A

